SECTION C Descriptions and Specifications

1.0 INTRODUCTION

1.1 **Background**.

The mission of the Naval Surface Warfare Center, Carderock Division (NSWCCD) Machinery Research and Development (R&D) Directorate is to perform research and development on naval shipboard machinery systems and equipment, including stealth, energy conservation, vulnerability, affordability, and maintainability. Functions include a full spectrum of technical capabilities in propulsion machinery, auxiliary machinery, electrical machinery, hull and deck machinery, submarine sail systems, habitability and hull outfitting machinery. The emphasis is on exploratory development which entails: developing and maintaining the expertise to design advanced machinery systems and equipment; providing the experimental facilities necessary to evaluate advanced and developmental machinery systems and equipment; and developing and validating fundamental concepts relating to machinery systems and equipment technologies (e.g., fluid mechanics, acoustics, electro-magnetics, and energy). The Directorate works in close coordination with other groups within the Naval Surface Warfare Center and the Naval Sea Systems Command to ensure a total ship systems engineering approach is maintained.

The efforts of the Directorate are exemplified by the divisional organizational units: Electrical Systems, Power Systems, Machinery Silencing, and Special Programs Departments. The work areas of the departments are aimed towards providing, at minimum cost, the present and future Navy with machinery systems that meet stated or implicit requirements for: new or extended depth, range, speed, and better control; quicker or more responsive action; quieter operation; greater life; higher reliability; and improved safety. The Directorate represents the only Navy organization that has the development of naval machinery for its primary mission.

Electrical Systems Department
Conducts R&D and develops improved equipment for electrical power generation, control, distribution, conditioning, protection, and utilization in ship service and propulsion and associated special electrical systems. Performs measurements and analyses of electro-acoustic sources and develops shipboard equipment and techniques to eliminate these sources.

Power Systems Department
Plans and conducts R&D to improve naval prime movers, with emphasis on gas turbine and diesel engines. Improves naval propulsion power transmission systems with emphasis on reduction gears, shafting, bearings, and seals. Develops and demonstrates naval auxiliary machinery, including high pressure air, fresh water production, HVAC systems, and hydraulic power and control systems. Develops advanced non-nuclear energy conversion and energy storage technology. Conducts R&D in machinery technologies such as fluid mechanics, structural analysis, heat transfer, power plant materials, and propulsion machinery maintenance and control devices. Develops and demonstrates technologies, methodologies, and systems to detect, diagnose, and predict machinery system condition for assessment of maintenance requirements and availability. Plans, manages, and conducts R&D in pulse power supplies for shipboard high energy loads.

Machinery Silencing Department
Identifies and assesses the military significance of noise/vibration sources in machinery systems on surface and subsurface vehicles. Analyzes and predicts acoustic and structural responses of shipboard machinery systems. Conducts R&D for noise/vibration reduction in machinery systems and components, and controlling noise transmission paths in shipboard installation. Performs acoustical design, analysis, and experimental verification of machinery, piping systems, and foundation structures. Performs experimental verification of acoustic design performance of shipboard machinery and piping systems. Performs instrumentation and measurement technique development for acoustic characterization of machinery, components, and structures.

Special Programs Department

Conducts machinery systems simulation and develops sensing, monitoring, and control components and systems. Evaluates ship Hull, Mechanical and Electrical (HM&E) systems for survivability and effectiveness in combat situations; and develops equipment and design and installation practices to enhance both. Conducts RDT&E to improve electro-magnetic signature control for surface ships and submarines. Operates and maintains the deep ocean pressure tanks, the Machinery Systems laboratory, and the Magnetic Fields laboratory. Assembles conceptual machinery system arrangements and analyzes their performance and ship impact for specific applications.

1.2 Implementation.

The contractor shall perform task assignments within the task areas generally described in section 2.0 below. NSWCCD will have overall control and responsibility for the projects for which written work assignments, hereinafter called "Task Orders," will be issued. A more detailed description of the required work within the scope of this contract will be provided in the task orders. The majority of the work entailed in these tasks shall require the contractor to make use of NSWCCD facilities and equipment, as outlined in the task orders. The contractor's control and responsibility shall be limited to the satisfactory execution of the work specified in the task orders.

The intent of this contract is to provide support to NSWCCD and NAVSEA in the form of engineering expertise on shipboard electrical and mechanical systems. Technical support for the installation of test and development hardware is also included as is associated program/project management and financial management support.

The contractor shall not, under any circumstances, be placed in the position of making any decisions that should be made by the Government, nor will the contractor, acting alone, produce any documents that represent a Government position. However, the contractor may be tasked to produce parts of documents (not involving direct or indirect performance of Government decision making) and may also be tasked to produce, as a convenience to the Government, an end-use document where the Government functions (i.e., decisions and position) are completely the work of the Government.

2.0 SCOPE OF WORK

The support to be provided hereunder shall require expertise in the technical disciplines used in both specific scientific fields and broad multi-disciplinary engineering fields. The contractor shall provide services, incidental materials, facilities and personnel necessary to perform specific tasks within the following general tasking areas as specified on the individual task orders. In all cases, the contractor shall provide recommendations to the appropriate Government personnel and shall not make programmatic decisions on behalf of the Government.

2.1 Program Planning and Management.

(a) PROGRAM PLANNING/STATUS - Develop program planning documentation such as Program Plans, Test Objectives, Plans of Action and Milestones, and program issue papers for future research. Analysis of technical goals and/or facility requirements to support the research, development, test and evaluation (RDT&E) of HM&E systems. This analysis may require the identification of resources, identification of planning shortfalls, facility site surveys, and recommendations for successful completion. Coordination of contractor and Government progress towards the completion of planned events.

(b) DOCUMENT PREPARATION AND REVIEW - Prepare technical and management reports that document efforts conducted in each of the task areas within the scope of this contract. Reports may be informal summary type reports or drafts of formal technical reports. Reports may summarize activities by the contractor, the Government, and/or other Government prime item development contractors. Assist in the review of Government furnished technical documentation and provide comments relative to established technical objectives. Prepare military equipment specifications and equipment acquisition specifications in support of Navy program offices.

(c) PRESENTATION MATERIAL- Prepare recommended inputs for program/project briefings and presentations. Prepare presentation materials such as viewgraphs and videotapes. Provide support of technical writing and report publication, design and implementation of web sites, development and population of digital databases, and related services.

(d) BUDGET/FINANCIAL REVIEW - Perform cost versus effort studies. Prepare financial status reports tracking both internal and program wide progress. Prepare updates for financial/technical plans of action and milestones.

2.2 Shipboard Technology Research.

(a) DEVICE/COMPONENT DEVELOPMENT - Perform analytical and engineering support for the development, fabrication, and demonstration of new HM&E devices/components. This may include reviewing device designs, observing manufacture and factory testing, development of prototype device topologies, and test setup and conduct. Evaluate Navy equipment applications and performance of trade-off assessments of component characteristics identifying potential risks/benefits. Evaluate the thermal properties and packaging requirements for new devices. Conduct market research to determine the availability of commercial-off-the-shelf (COTS) solutions. Develop piping system components for fluid, pneumatic, and hydraulic systems.

(b) MODELING/SIMULATION - Develop analytical and finite element models of alternative hull, mechanical, and electrical concepts capable of simulating both the operational and structural characteristics of the concepts including electric power generation and distribution, thermal, acoustic, and electro-magnetic (EM) prediction and control. Devise methods and models to perform total ship system engineering and total ownership cost analysis to evaluate Navy equipment applications. Exercise methods and models to perform trade-off assessments of machinery system and component characteristics identifying potential cost/performance benefits.

(c) MATERIALS STUDIES - Planning, organization and conduct of material studies which includes the preparation and testing of specimens and interpretation of their microstructure, and the development of sample preparation techniques for new materials.

(d) SYSTEMS ENGINEERING - Analysis and evaluation of electrical/mechanical system and sub-system designs recommended for Navy ship applications with emphasis on stability, steady-state and transient performance, continuity, quality, and survivability. Analysis of device, equipment, subsystem and system interactions within a combined environment with emphasis on interface definitions and control. Review and provide comments to system interface specifications, functional requirements, and component specifications including applications to machinery acoustics and open architecture machinery and electrical systems. Optimization of machinery manning requirements for given systems by performing trade-offs to optimize machinery automation versus crew size, performing human factors analysis to optimize man/machine interfaces, and evaluating design and cost impacts due to manning changes. Devise methods to predict reliability and maintainability (R&M) performance for new machinery systems, exercise the methods, evaluate cost impact, collect field data, and validate predicted performance and assess R&M requirements.

(e) SIGNATURES - Analysis and study of the reduction of infrared, acoustic, and electromagnetic signatures for existing and proposed surface and subsurface vehicles and craft.

2.3 Component and System Test and Evaluation (T&E).

(a) TEST PLANNING - Perform analysis of Naval machinery test objectives and information needs associated with the development of new, or modifications to existing, sub-scale and full-scale T&E facilities. Conduct ship checks and provide installation plans for RDT&E demonstration equipment and shipboard hardware for HM&E tests and evaluations. Provide plans for full-scale trials (speed/power, noise, etc.).

(b) TEST SETUP - Develop measurement system concepts employing commercial and special purpose sensor, signal conditioning and transmission, signal recording and processing, and on-line display devices. Design, fabricate, calibrate and operate data gathering, reduction, and analysis systems necessary to evaluate HM&E system designs as to performance, shock, vibration, and signature characteristics. Assemble equipment components, install equipment, validate and verify test setup and test suite operating software, conduct operability verification (shakedown) tests, and calibrate equipment for Navy laboratory and test craft testing. Install equipment on Navy surface ships and submarines and other demonstration platforms as necessary to facilitate testing.

(c) TEST CONDUCT - Conduct component and system testing and data collection. Acquire all necessary components and systems for test and evaluation conduct. Perform data acquisition, reduction and analysis of advanced naval machinery and structures testing relative to hull and machinery vibration, platform noise, cavitation, EM, and related performance evaluations. Support trials by collecting and analyzing data, calibrating instrumentation, and providing on-site technical support.

(d) TEST REPORTING - Perform analysis of data collected by the contractor or the Navy and provide conclusions drawn from the results. Preparation of data packages and supporting documentation from on-site data acquisition and post-trial data reduction evolution. Prepare test plans, test procedures and test reports. Test plans shall identify tests to be conducted, general test method, testing schedule, and data to be acquired. A complete list of test cases shall be included in the test plan. Test reports shall include test objectives, procedure summaries, test results, and conclusions for the tests identified in the scope of work.

4.0 Technical Data Requirements

Technical data requirements will be specified in each task order. The type of data to be generated shall include but may not be limited to: technical reports, assessments, analyses, manuals, historical summaries, program overviews, presentation materials/handouts, brochures/pamphlets, draft specifications, technology plans, data packages, documentation of requirements, analysis studies, production/work support activities evaluations, and documentation. In addition to the specific technical data requirements for each task order, the following report shall be prepared for the contract as a whole:

(a) Letter Status Report (ELIN A001 OF EXHIBIT A)

The contractor shall provide one (1) copy of a letter-type status report monthly which shall briefly describe the work performed during each reporting period together with the significant results thereof. The report shall describe any problems encountered and propose solutions for their resolution. The report shall further provide the current technical and financial status of the effort. Electronic submission of this report is acceptable provided a suitable format can be agreed to between the contractor and the contract COR. The narrative for each task order shall be as concise as possible given the relative complexity of the associated efforts (no more than 2 paragraphs as a guide). The financial status of the contract shall be presented with a single table showing the task order numbers as row titles and column headings including CLIN amounts, present incremental funding, monthly expenditures, cumulative expenditures, balances, and expiration date. Appropriate column headings shall be further broken down by labor, materials/travel, and incidental subcontracting.

5.0 Technical Conferences

Contractor personnel shall be available for informal conferences with NSWCCD technical personnel as required throughout performance to discuss the direction, progress, and/or significant problems encountered, and to discuss technical and fiscal information required for performance of each task order.

7.0 Security Requirements

During the performance of this contract, the contractor shall be required to have access to, and may be required to receive, generate, and store information classified to the level of SECRET. Therefore, Contractor facilities used in support of this contract must be granted SECRET facility clearances and have the capability to store material classified up to and including SECRET.